

FUNCTIONAL COMMUNICATION TRAINING TO REDUCE CHALLENGING BEHAVIOR: MAINTENANCE AND APPLICATION IN NEW SETTINGS

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We evaluated the initial effectiveness, maintenance, and transferability of the results of functional communication training as an intervention for the challenging behaviors exhibited by 3 students. Assessment indicated that escape from academic demands was involved in the maintenance of the challenging behaviors. Social attention was also implicated as controlling the behavior of 1 student. The intervention involved teaching alternative assistance-seeking and attention-getting phrases to the students in an effort to replace challenging behavior with these verbal equivalents. Multiple baseline data collected across the 3 students indicated that not only did the intervention substantially reduce challenging behavior but also that these results transferred across new tasks, environments, and teachers, and were generally maintained from 18 to 24 months following the introduction of functional communication training. These results are discussed in light of recent efforts to develop effective interventions for severe challenging behavior and to understand the processes underlying transfer and maintenance of intervention effects.

DESCRIPTORS: functional analysis, communication, self-injurious behavior, generalization, maintenance

Perhaps the most important challenge facing those in the field of developmental disabilities is promoting transfer and maintenance of intervention efforts (Horner, Dunlap, & Koegel, 1988; Murphy & Wilson, 1981). It is generally recognized that our technology has been successful in producing change in the behavior of a large percentage of the individuals who seek clinical, educational, or vocational services. However, successful transfer of these intervention effects to new persons and environments and the maintenance of these effects over long periods of time has at times been an elusive goal (Stokes & Baer, 1977). To be considered meaningful, behavior change must occur beyond the confines of our treatment settings and

with intervention agents who may not be specially trained in behavioral strategies.

One target of these interventions that illustrates these concerns is the challenging behavior exhibited by individuals with severe disabilities. Behaviors such as severe aggression, self-injurious behavior, and violent tantrums significantly restrict the lives of those who engage in them (Durand & Carr, 1989). For example, although recent attempts have been made to provide less restrictive environments for those with severe handicaps, these opportunities continue to be withheld from some individuals who are extremely disruptive (Eyman & Borthwick, 1980; Eyman & Call, 1977; Jacobson, 1982). These disruptive behaviors represent a major obstacle to the habilitation of individuals with severe handicaps (Meyer & Evans, 1989).

A plethora of intervention procedures has been developed with the goal of reducing severe challenging behavior. The most prevalent method often involves some form of noncontingent physical or chemical restraint, although such procedures are usually viewed as temporary crisis-management approaches (Helmstetter & Durand, 1990; Singh & Millichamp, 1985). Behavioral interventions have

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taken a variety of forms (Harris & Ersner-Hersfield, 1978; LaVigna & Donnellan, 1986; Lennox, Miltenberger, Spengler, & Erfanian, 1988), including contingent electric shock (e.g., Lovaas & Simmons, 1969), overcorrection (e.g., Foxx & Bechtel, 1983), contingent restraint (e.g., Gaylord-Ross, Weeks, Lipner, & Gaylord-Ross, 1983), and time-out from positive reinforcement (e.g., Repp & Deitz, 1974).

Considerable controversy continues to surround the use of procedures involving aversive stimuli, particularly when used with persons who have severe disabilities (Meyer & Evans, 1989). Partly in response to concerns about the use of these procedures, alternatives without painful or stigmatizing consequences have been the focus of much recent attention. One such alternative involves teaching behaviors that are functionally equivalent to the student's challenging behavior. The logic behind this approach is that if the student has another, more efficient way of obtaining the consequences that maintain his or her problem behavior, use of the alternative behavior will simultaneously reduce the use of challenging behavior. One variation of this intervention strategy uses communicative behavior as the functionally equivalent response and has been referred to as *functional communication training* (Durand, 1990).

Functional communication training has been evaluated as an intervention for a variety of problem behaviors (Carr & Durand, 1985). Substantial initial reductions have been observed when using this intervention with behaviors such as severe aggression, self-injury, and tantrums (e.g., Bird, Dores, Moniz, & Robinson, 1989; Carr & Durand, 1985; Durand & Kishi, 1987; Horner & Budd, 1985; Hunt, Alwell, & Goetz, 1988; Wacker et al., 1990), noninjurious stereotyped behavior (Durand & Carr, 1987), psychotic speech (Durand & Crimmins, 1987), and other communication disorders (Carr & Kemp, 1989). Early results of the clinical effectiveness of this approach have been encouraging. The observed reductions in these behaviors have often been rapid (often within a few days) and clinically significant (Durand, 1990).

As mentioned above, there is a particular need

for interventions that significantly reduce severe challenging behavior across a variety of environments and continue to be effective over long periods of time. Rarely has long-term and meaningful change in the lives of persons with challenging behavior been demonstrated as a function of behavioral interventions (Berkman & Meyer, 1988). In the present study, we sought to replicate previous successes using functional communication training with students exhibiting severe behavioral needs. In addition, we assessed maintenance and transfer of these results across teachers and classrooms over relatively long time periods (i.e., 18 to 24 months).

STUDY 1

METHOD

Participants and Setting

Three boys who attended a school for children with developmental disabilities participated in both studies. These students had been selected because they displayed frequent, severe, and chronic challenging behavior. All 3 boys regularly attended school in the same classroom with 3 other students, a teacher, and a teaching assistant.

The mental age (MA) for each student was determined by a psychologist (not otherwise affiliated with the research) using a combination of the Bayley Scales of Infant Development and the Vineland Social Maturity Scale. Language age (LA) was determined by a speech therapist, using the Reynell Developmental Language Scales. Tim was 12 years old at the start of the study (MA = 65 months, LA = 52 months) and had received diagnoses of moderate mental retardation and autism. Tim could say several phrases (e.g., "I want to go home now."), in addition to engaging in frequent echolalia. He was described by his teacher as easily frustrated and would cry, scream, and hit himself numerous times during the day. Tim's head hitting often resulted in red swollen cheeks and periodically required medical attention because of tissue damage. Hal was also 12 years old and had been diagnosed as having severe mental retardation and autism (MA = 32 months, LA = 26 months). Hal's expressive language abilities were limited to words or short

phrases prompted by others. Hal exhibited violent tantrums throughout the day; these involved screaming, head banging, and face slapping that often left his face bleeding. Ben was 9 years old at the start of this study and had been diagnosed as having moderate mental retardation and pervasive developmental disorder (MA = 44 months, LA = 33 months). He could say four to five words to make his needs known (e.g., "bathroom," "drink"). He was described as being both likable and mischievous, and frequently disrupted teaching efforts by laughing, falling on the floor, and pinching and slapping others.

A variety of behavioral interventions had been used with the boys in attempts to reduce their challenging behaviors. Over the years, these interventions included differential reinforcement of other and incompatible behavior (DRO and DRI), in-the-classroom and out-of-the-classroom time-out, overcorrection, restraint, and medical interventions (e.g., Mellaril, Haldol). None of these previous interventions resulted in significant improvements in challenging behavior for more than a few weeks, and none of them were being used at the start of the present study.

All sessions were conducted in the students' classroom. Two research assistants observed and collected data through a one-way mirror looking into the classroom. All assessment and subsequent intervention activities were carried out in the context of their regularly occurring activities. Table-top assessment tasks (e.g., counting change), for example, were conducted at the students' desks, and other tasks (e.g., putting on coat) were carried out in their typical contexts (e.g., by the coat rack).

Procedures and Design

Two assessment procedures were used. First, the students' teacher and assistant teacher were asked to complete the Motivation Assessment Scale (Durand, 1990; Durand & Crimmins, 1988). Next, based on the findings from this scale, a functional analysis of the students' challenging behaviors was conducted. Three experimental conditions (baseline, attention, escape) were introduced in an A-B-A-C-A-C-A-B-A design (Barlow & Hersen, 1984)

to assess the influence of adult attention and task difficulty on the students' challenging behaviors. Each student participated in 10-min sessions of each condition for two or three sessions per day. When multiple sessions were run on the same day, there was a 5- to 10-min break between sessions.

The Motivation Assessment Scale (MAS)

Prior to the functional analysis, the students' teacher and assistant teacher completed the MAS. This scale includes 16 questions about the possible influence of social attention, escape from unpleasant situations, tangible reinforcers, and sensory feedback on challenging behavior (Durand, 1990; Durand & Crimmins, 1988). Respondents are asked to rate the likelihood of the target behavior occurring in various situations on a 7-point Likert-type scale. Research suggests that this scale has adequate test-retest and interrater reliability and validity (Durand & Crimmins, 1988; Durand, Crimmins, Caulfield, & Taylor, 1989). Each of the instructors was given two copies of the scale for each of the 3 students. They were requested to complete a separate MAS for each of the two identified challenging behaviors. The scores are presented in Table 1.

Tim's and Hal's behaviors received the highest scores on the escape category, suggesting that their behavior problems may have been maintained by escape from certain situations. Ben's behaviors were rated high on both escape and attention, suggesting the possible role of both of these influences. To validate these hypotheses, an experimental analysis of the respective roles of escape and attention was conducted.

Functional Analysis

The procedures used in this phase of the study are described in more detail elsewhere (e.g., Durand & Carr, 1987). Tasks were selected individually for each student from those being used in their classrooms. Each task was assessed to determine which elements were easy or difficult. Stimuli were selected from each task so that the student could respond correctly 100% of the time to the easy group of stimuli and approximately 25% of the time to the difficult group of stimuli. For example,

Table 1
Responses on the MAS by the Students' Teachers

	Tim				Hal				Ben			
	Sensory	Escape	Attention	Tangible	Sensory	Escape	Attention	Tangible	Sensory	Escape	Attention	Tangible
Behavior 1												
Teacher	3.50	4.25	1.50	3.00	4.50	5.50	1.50	3.75	1.00	4.00	4.25	3.00
Assistant teacher	2.75	5.00	0.75	2.75	3.75	4.50	2.00	2.00	0.75	5.00	4.75	2.75
Behavior 2												
Teacher	2.25	4.00	1.00	3.00	2.75	5.00	2.25	4.00	1.50	5.25	5.25	2.00
Assistant teacher	1.75	4.75	1.50	4.00	2.25	4.75	2.75	3.00	1.75	4.50	4.75	2.00

an easy version of putting on shoes involved requiring the student to complete the last step in a backward chaining procedure (e.g., pulling the loops of the shoe laces tight). A difficult version required the student to complete the last three steps (e.g., making the loops, tying them together, and pulling them tight). If the student's performance on the difficult version improved over several trials, the next step was added (e.g., holding both laces and looping them around each other), so that the student continued to respond at about 25% correct. Counting change and putting on his coat were used as tasks for Tim. Putting on shoes and emergency-skills training were used with Hal, and putting on a coat and emergency-skills training were used with Ben.

Baseline. The stimuli used in these sessions were those assessed to be easy. The two tasks were alternated, 5-min each, within each 10-min session. Every third correct response was praised (e.g., "Very nice!"), providing a variable-ratio 3 (VR 3) schedule. This ratio was selected to be comparable to the other assessment sessions (escape and attention). Occasional incorrect responses were followed by statements such as "No, that's not right." Some form of attention was provided by combining praise, commands, and neutral comments (e.g., "It's nice and quiet in here today.").

Subsequent assessment sessions were constructed by manipulating either the difficulty of the task or the distribution of adult attention (without changing the number of praise statements, requests, or comments). Trainers were instructed to continue all

ongoing activities despite the presence of challenging behavior whenever possible. If the behavior threatened to be dangerous to the student or others, the trainers were to block these behaviors and continue with the session as soon as possible.

Attention. The easy stimuli from each task were presented to the students as in baseline. All other procedures were identical to those in baseline, except that attention to the students was decreased. Two thirds of the intervals now contained no attention by the trainer, and one third of the intervals contained a praise statement, a request, and a comment. Therefore, during most of the session the trainer did not interact with the student. Previous work has demonstrated this to result in increased rates of behavior presumably maintained by adult attention (Durand & Carr, 1987; Durand and Crimmins, 1988).

Escape. These sessions were conducted as in baseline, except that stimuli were selected to produce a difficult task. The presentation of praise, requests, and comments was made as in baseline. Now, however, the tasks were introduced with stimuli that would produce approximately 25% correct responses. As in the other conditions, incorrect responses were followed by feedback from the trainer (e.g., "No, that's not correct."), and the presentation of the next trial.

Response Definitions and Observer Agreement

Student behaviors (challenging behavior, task responding) and trainer behaviors (praise, requests,

comments, and no response) were both recorded. Trainer behavior was monitored to ensure the integrity of the independent variable manipulation. All responses were recorded using a continuous 10-s interval procedure.

Tim's *head hitting* was defined as any time he hit his head with his fist in a forceful manner. Forceful was defined as hard enough that his head moved as a consequence of the hit. *Hitting other* was defined as any time he struck another person with either his fist or his open hand. Hal's *face slapping* was defined as any time he hit his face with the palms of his open hand in a forceful manner. *Head banging* was defined as any time he hit his head on an object (e.g., table top, floor, wall). Ben's *pinching others* was defined as any time he grabbed another person with his thumb and his index finger. *Slapping others* was defined as any time he struck another person with his open hand.

Correct responses were recorded for each of the tasks if the child accurately responded to the request within 10 s (e.g., if the student put his arms in the sleeves of his coat following the request, "Put on your coat."). An incorrect response was scored if the child did not respond accurately or did not respond at all within 10 s. *Praise* was defined as any form of verbal approval (e.g., "That's right!"). *Requests* were defined as any task-related statement made by the trainer (e.g., "Put on your coat." or "What is your name and address?"). *Comments* were defined as any descriptive remarks made by the trainer (e.g., "It sure is cloudy today!").

Observer agreement was assessed during 100% of the sessions by trained undergraduate observers. Training was conducted until observers reached a criterion of 75% agreement on all responses with the standard observer (an undergraduate with prior observer experience). Observer records were compared on an interval-by-interval basis. Agreement scores were computed as the number of agreements divided by the number of agreements plus disagreements. The mean occurrence agreement score was 78% or higher for all participants and response categories (range, 78% to 100%). The mean non-occurrence agreement score was 75% or higher for

all participants and response categories (range, 75% to 100%). Individual observer agreement data for each response category are available from the first author.

RESULTS AND DISCUSSION

Independent Variable Manipulation

Group averages are reported here; however, individual data are consistent with the group means and may be obtained from the authors.

The data on task performance were consistent with our attempts to establish easy versions of the tasks for the baseline and attention conditions (i.e., approximately 100% correct responses) and difficult variations of the tasks for the escape condition (i.e., approximately 25% correct responses). The mean percentage correct during baseline was 91.6% (range, 78% to 100%), for attention was 90.0% (range, 77% to 100%), and for escape was 22.3% (range, 14% to 38%).

Mean percentage of intervals including praise was 32.6% (range, 28% to 38%) for baseline, 32.8% (range, 25% to 37%) for attention, and 31.2% (range, 26% to 38%) for escape. Mean percentage of intervals including requests was 31.9% (range, 24% to 40%) for baseline, 32.0% (range, 25% to 37%) for attention, and 31.8% (range, 28% to 37%) for escape. Mean percentage of intervals including comments was 31.0% (range, 24% to 36%) for baseline, 32.9% (range, 27% to 36%) for attention, and 31.9% (range, 25% to 37%) for escape. Finally, the mean percentage of intervals involving no trainer response (i.e., no recorded instances of praise, requests, or comments) was 1.4% (range, 0% to 3%) for baseline, 67.1% (range, 63% to 69%) for attention, and 1.2% (range, 0.5% to 2.1%) for escape. The data for trainer attention were consistent with our efforts to construct a 33% level of praise, requests, and comments across all conditions as well as to provide trainer attention in only one third of the intervals during attention.

Challenging Behavior

Figure 1 illustrates the results of the functional analysis of the challenging behavior displayed by

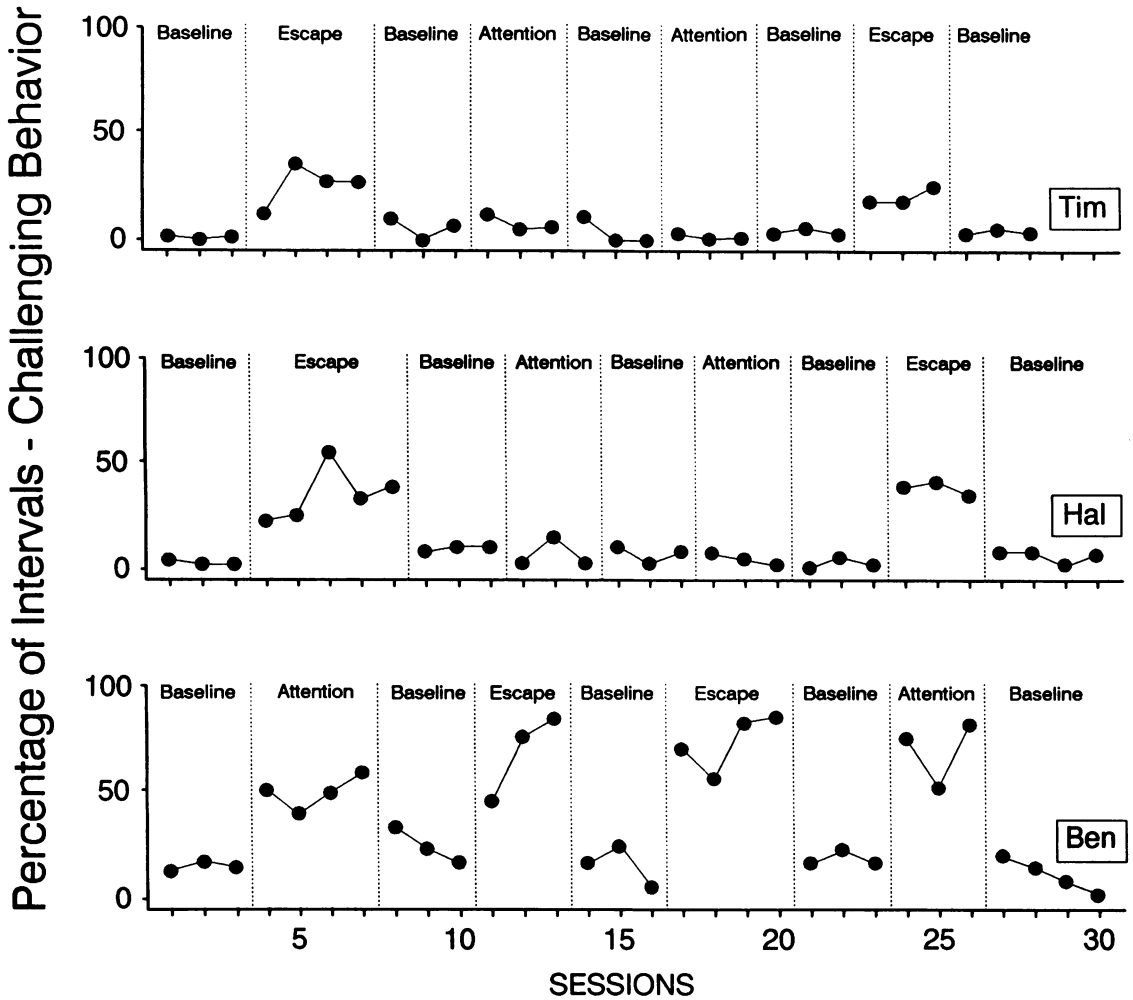


Figure 1. Challenging behaviors of each of the participants as measured in the functional analysis sessions.

each boy. Data on each of the two selected behaviors for each student were equivalent, so these data are combined in Figure 1. The mean rate of challenging behavior for Tim was 3.5% (range, 0% to 12%) during baseline, 4.3% (range, 0% to 15%) during attention, and 23.1% (range, 12% to 35%) during escape. The mean rate of challenging behavior for Hal was 3.9% (range, 0% to 10%) during baseline, 2.8% (range, 0% to 10%) during attention, and 30.3% (range, 22% to 55%) during escape. The mean rate of challenging behavior for Ben was 12.8% (range, 2% to 27%) during baseline, 55.0% (range, 37% to 75%) during attention, and 67.9% (range, 40% to 85%) during escape.

These data support the results obtained from the

MAS. The challenging behavior of all 3 students increased when the difficult tasks were introduced, suggesting that escape from tasks may have been maintaining these behaviors. The challenging behaviors exhibited by Tim and Hal did not increase over baseline levels during the attention condition, but this manipulation did result in increased levels of challenging behavior for Ben. This latter finding suggests that adult attention was an additional controlling variable for Ben's behavior, but not for Tim's or Hal's, again supporting the results from the teachers' ratings on the MAS.

Results from these assessments should be viewed with caution. As with any functional analysis, the present methodology cannot be said to determine

conclusively the function of these students' challenging behaviors. For example, the attention condition involved the manipulation of trainer attention as well as the instructional format (e.g., rate of instruction, type of intertrial interval), thus permitting alternative interpretations. However, the convergent nature of the assessment data (i.e., agreement between the functional analysis and the MAS) provides more confidence in the conclusions drawn from these procedures. The next study was designed to assess whether teaching these students alternative ways of obtaining these reinforcers (escape and attention) would affect their challenging behavior.

STUDY 2

METHOD

Participants and Setting

The students and settings were the same as in Study 1.

Procedures and Design

This study involved teaching the students alternate communicative responses to serve the same function as their challenging behavior. For example, if a student's challenging behavior was maintained by escape from difficult requests, then the student was taught to request assistance on tasks. Similarly, if a student's behavior was maintained by attention, then he was taught an appropriate response for obtaining more attention. Previous research has suggested that this type of intervention may initially reduce challenging behavior (Carr & Durand, 1985; Durand & Carr, 1987; Durand & Crimmins, 1987; Durand & Kishi, 1987). The present study sought to evaluate its long-term effectiveness and possible transfer across teachers and settings.

Study 2 relied on a multiple baseline across students design (Barlow & Hersen, 1984) to assess the effects of functional communication training on challenging behavior. Baseline involved observation of each student in the classroom at random times throughout the day. Each student was observed for 60 min per day during regular classroom activities. The teacher was requested to conduct these activities with no modifications. All observations were

conducted through a one-way mirror looking into the classroom. All instances of challenging behavior were handled by the teacher and assistant teacher. Throughout this study, the consequences for challenging behavior included ignoring (i.e., acting as if the behavior was not occurring) or blocking the more severe responses to prevent injury. No consequences causing pain or discomfort were used.

Following baseline, each student was taught to request assistance with tasks and (in Ben's case) to request social attention. To teach the students assistance-seeking requests, training was conducted using the difficult stimuli selected for the assessment tasks. Initial response training began with the presentation of these stimuli. For example, Hal was being taught to give his address when asked the question, "Where do you live?" When he incorrectly responded to this or similar questions, the trainer provided feedback ("No, that's not correct.") and a prompt to imitate the alternate communicative phrase ("Say, 'I don't understand.'"). This continued until the student could imitate the correct response ("I don't understand."). (See Durand, 1990, for a more detailed description.)

The prompts were then faded and delayed for several seconds until the student responded with the assistance-seeking phrase following the phrase "Say" alone, and then later after only negative feedback from the trainer. Next, the corrective feedback was delayed until the student responded with the assistance-seeking phrase following a request to perform a difficult task (Halle, 1988; Halle, Baer, & Spradlin, 1981). Each assistance-seeking request was followed by task-related prompts (e.g., "You live at 71 Smith Street, where do you live?"). A criterion of three of five correct responses was required before moving to the next training step. Tim and Ben were taught to request assistance by saying the phrase, "Help me," because this appeared to be most appropriate for those situations in which they had the most difficulty (e.g., putting on a coat).

Teaching Ben to request teacher attention was conducted in a similar manner. Teaching the attention-getting phrase occurred while Ben was being asked to work on one of the easy assessment

tasks. During most of these sessions, the trainer was turned away from him and engaged in other activities. Approximately every 60 s, the trainer turned towards Ben and repeated, "Say, 'Am I doing good work?'" This continued until Ben responded to this prompt by saying "Am I doing good work?" The prompts were then faded and delayed for several seconds until he responded to the phrase "Say" only, to only the trainer turning towards him, and finally without any trainer prompts. All attention-getting requests were followed by 10–15 s of trainer attention (e.g., discussions about the work or phrases such as, "Yes, you are doing very nice work, good job!").

No praise statements or tangible consequences were provided for assistance-seeking responses, and no task-related prompts or tangible consequences were supplied for attention-getting requests in the training settings. Challenging behavior was ignored by the trainers. Training was carried out in the classroom initially by the first author and later by trained undergraduate students. Three trainers were introduced across each of the two tasks to promote transfer to the classroom teachers. Training time varied for each student and averaged 130 min (range, 60 to 240 min). The classroom teachers were told to respond to the students as they typically did, and were given no instruction in our procedures. Therefore, the use of praise as prompts was controlled only with the trainers, and the students continued to receive a variety of tasks in a variety of instructional formats with their teachers throughout the day.

Follow-up observations. At the end of the academic year in which the students were involved in functional communication training (Year 1), there was a break from school lasting several weeks. After this break, the 3 students returned to the same school, but each student was placed in a different classroom with a different teacher (i.e., they were no longer together in the same class in Year 2). The change of placement occurred because the students were seen as no longer requiring a special class for students with challenging behavior. To assess the effects of the intervention in Year 1 without any new intervention efforts, the new teachers were not informed of the students' participation in

the research the previous year. The observers made 11 unannounced visits to the students' classrooms during Year 2 to evaluate their progress. Following another summer break, two unannounced visits were made during Year 3 to assess further the students' progress.

During Year 2, Hal again engaged in high rates of challenging behavior and requested assistance infrequently. An informal assessment suggested that his articulation of the assistance-seeking phrase "I don't understand" had deteriorated in quality, and his new teacher was not responding to the phrase with assistance. A second procedure (described in more detail below) was established for him, whereby observers sequentially recorded instances of teacher requests and prompts, Hal's assistance-seeking phrase, and his challenging behaviors. This permitted inferences about the role of his requests for assistance on his challenging behavior.

After 7 days of observation in Year 2, we conducted booster sessions with Hal outside of his classroom, in which he was taught to articulate the assistance-seeking phrase more clearly and more slowly. Three 20-min sessions were conducted over 3 days. His teacher was told that assessments were being made during these times. We did not inform her of our training, in order to evaluate whether a change in Hal's behavior alone would result in assistance by the teacher, which in turn should reduce his challenging behavior. Observations continued for Hal during the remaining part of Year 2 and during 2 observation days in Year 3.

Response Definitions and Observer Agreement

The challenging behaviors defined previously were recorded during the 60-min observation sessions in the classroom. These observations occurred both before functional communication training and after the training sessions were conducted without trainers present in the room. In addition, instances of unprompted requests (the assistance-seeking and attention-getting requests) were recorded before and after intervention. For Tim, Hal, and Ben, an assistance-seeking phrase was scored if the student said "Help me" (for Tim and Ben) or "I don't understand" (for Hal) following a request, but only if the teacher did not provide a prompt (e.g., "Say

'I don't understand.''). Similarly, an attention-getting phrase was scored for Ben if he said "Am I doing good work?" without any obvious prompts by the teacher.

Observer agreement was assessed during approximately one third of the observation sessions by trained undergraduate observers. As in Study 1, observer training was conducted until observers reached a criterion of 75% agreement on all responses with the standard observer (an undergraduate with prior observer experience). Observer records were compared on an interval-by-interval basis. The mean occurrence agreement score was 83% or higher for all participants and response categories (range, 83% to 100%). The mean nonoccurrence agreement score was 79% or higher for all participants and response categories (range, 79% to 100%). Again, individual observer agreement data for each response category are available from the first author.

During Years 2 and 3, a second observation system was set up for Hal to assess why his rates of challenging behavior and assistance-seeking requests had changed. This sequential observation system was adapted from Patterson (1982) and involved recording the presence of Hal's challenging behaviors (CB), his requests for assistance (RA), teacher prompts (TP), and the teacher's task-related requests (TR) in order of their occurrence during 6-s intervals.

Using this system, we focused on three interaction patterns. The first, teacher request-challenging behavior (TR-CB), was assessed to determine whether the increased rates of challenging behavior were a function of teacher demands. The second, request for assistance-teacher prompt (RA-TP), was used to learn whether the teacher was responding to his requests for task assistance with prompts. The third, request for assistance-teacher request (RA-TR), was used to determine whether the teacher was not responding to his requests with prompts but instead was simply repeating the request.

We recorded data in these interactions for five 30-min sessions prior to the booster sessions and six 30-min sessions after the booster sessions. Observer agreement was assessed during 100% of the

sessions by comparing the number of targeted interactions scored by an observer with a second standard observer who had several years of experience (Wampold & Holloway, 1983). Agreement scores were computed as the number of agreements divided by the number of agreements plus disagreements. Mean agreement scores were 77% (range, 65% to 100%) for TR-CB, 71% (range, 55% to 97%) for RA-TP, and 74% (range, 61% to 100%) for RA-TR.

RESULTS AND DISCUSSION

Unprompted Requests

The data on unprompted requests generally confirmed our success in teaching the students to make requests for assistance and attention without teacher prompts. Prior to functional communication training, none of the students made the assistance-seeking or attention-getting requests without teachers' prompts (Figure 2). Following functional communication training, each student exhibited the requests without prompts. For Tim, the mean rate of unprompted assistance-seeking requests was 5.8% (range, 3% to 18%) in Year 1, 3.6% (range, 3% to 6%) in Year 2, 3.5% (range, 3% to 4%) in Year 3. For Hal, the mean rate was 6.4% (range, 5% to 12%) in Year 1, 3.3% (range, 0% to 9%) prior to booster sessions in Year 2, 9.5% (range, 8% to 12%) after booster sessions in Year 2, and 8.0% in Year 3. For Ben, the mean rate was 9.1% (range, 5% to 18%) in Year 1, 7.3% (range, 6% to 12%) in Year 2, and 6.0% in Year 3. The use of unprompted requests generalized across stimuli (to the new teachers and classrooms) and was maintained over time (through Years 2 and 3).

Challenging Behavior

Challenging behavior was reduced for each student following functional communication training (Figure 2). For Tim, mean rates of challenging behavior were 9.5% (range, 2% to 15%) in baseline, 0.3% (range, 0% to 3%) during Year 1 after intervention, 2.5% (range, 0% to 4%) in Year 2, and 0% in Year 3. For Hal, mean rates were 22.9% (range, 8% to 48%) in baseline, 4.8% (range, 0%

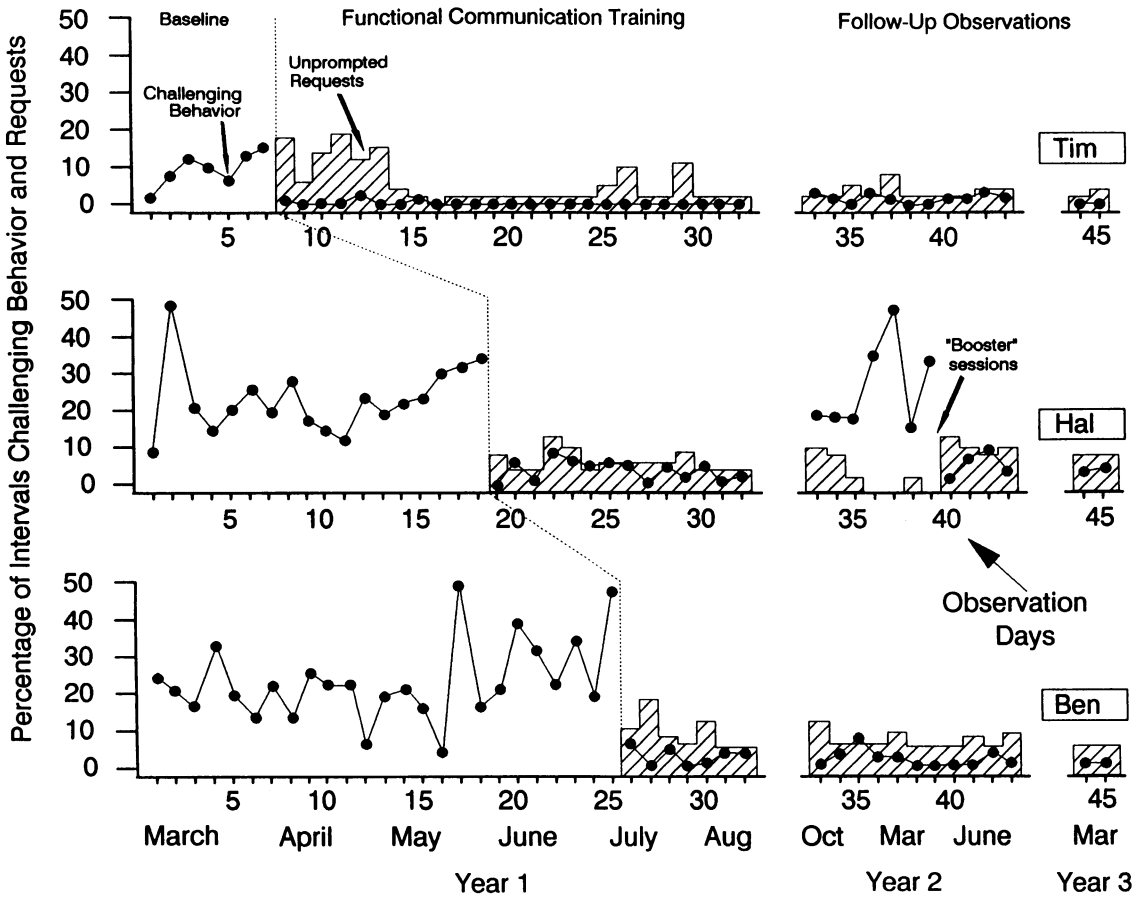


Figure 2. Challenging behavior and unprompted requests for each of the participants as a function of intervention. Each point on the graph represents data from each observation day from Years 1, 2, and 3.

to 8%) in Year 1, 25.7% (range, 16% to 47%) prior to booster sessions, 6.8% (range, 4% to 10%) following booster sessions in Year 2, and 5.5% (range, 5% to 6%) in Year 3. For Ben, mean rates were 22.7% (range, 5% to 48%) in baseline, 4.3% (range, 2% to 7%) in Year 1, 3.7% (range, 2% to 9%) in Year 2, and 3% in Year 3.

For all 3 students, challenging behavior was inversely related to the unprompted requests they were taught in the intervention. In other words, as unprompted requests increased, there was a corresponding decrease in their challenging behavior.

Sequential Observation Data for Hal

We calculated the probability of occurrence for each interaction segment by dividing the total number of instances of the interaction (e.g., the number

of TR-CB pairs) by the number of single instances of the initial behavior observed (e.g., the number of occurrences of TR). These calculations were made on the data both before and after the booster sessions. The probability of occurrence of TR-CB was 35.6% before and 3.9% after the sessions. The probability of occurrence of RA-TP was 11.5% before and 61.2% after the booster sessions. The probability of occurrence of RA-TR was 57.7% before and 8.1% after the booster sessions.

Taken together, these data suggest that in Year 2, prior to the booster sessions, Hal's increase in challenging behavior may have been a function of the teacher's task requests and her failure to provide help when he asked for assistance. She was more likely to repeat her request if he asked for help, rather than providing him with task prompts.

However, after we taught Hal to articulate his requests more clearly, these requests were more likely to be followed by assistance, and the teacher's requests were less likely to initiate an episode of challenging behavior. These data lend further support to the role of Hal's requests and the teacher's response to them in the control of his challenging behavior.

In retrospect, these results would have been strengthened by collecting sequential observation data on all 3 students, and by directly assessing the clarity of Hal's articulation before and after the booster sessions. Future efforts should expand the range of sequential data collected. Because previous studies demonstrated significant task acquisition in combination with functional communication training (Bird et al., 1989; Durand & Carr, 1987), these data were not specifically targeted for collection in the present study. However, concerns that students might escape from tasks too frequently and not engage in appropriate academic or vocational activities should be addressed directly through collection of data on task acquisition and performance in subsequent research.

GENERAL DISCUSSION

This study replicated previous successes using functional communication training as an intervention for challenging behavior. In addition, comprehensive and long-term follow-up observations of 2 of the 3 students indicated that the reductions in challenging behavior and the increases in the communicative responses taught transferred across teachers and classrooms and were maintained for up to 2 years. A return to high rates of challenging behavior by 1 student after the 1st year were attributable to his poor articulation of the trained phrase, and when this improved, his gains were reinstated and were maintained through another change in classrooms and teachers and over another year. These preliminary data support the use of functional communication training as an intervention whose effects may transfer and be maintained across several stimulus dimensions (teachers, classrooms, and tasks).

The present study joins several recent studies in reporting rapid reductions in challenging behaviors immediately following teaching of the functionally equivalent response (Bird et al., 1989; Wacker et al., 1990). In most cases, this reduction occurred within a few days of the initial intervention effort. One explanation for this phenomenon is that teaching an alternate but functionally equivalent response provides the student with a choice. The choice becomes one of obtaining a desired goal (e.g., escape from work) by either inappropriate (e.g., hand biting) or appropriate (e.g., signing for a break from work) means. If the training situation is constructed so that the appropriate response is more efficient in obtaining the goal than the inappropriate response is, the student should quickly choose to obtain the goal with the new response (Carr, 1988; Durand, 1990). Extinction bursts (i.e., increases in behaviors following the removal of reinforcement) should not occur because the student still has a way of obtaining comparable reinforcers.

Cumulative data from several studies have demonstrated that functional communication training may be effective because functionally equivalent responses are taught that replace the challenging behavior. Investigations using control conditions such as teaching alternatives that elicit stimuli not assessed to be maintaining the challenging behavior (e.g., Carr & Durand, 1985; Durand & Crimmins, 1987) and studies controlling for independent variable manipulations such as adult attention and task demands (e.g., Durand & Carr, 1987) have shown that behavior reductions cannot be attributed to physical incompatibility or stimulus control. The sequential observation data collected during the present study lend additional support to the functional equivalence explanation for the success of this intervention.

The maintenance and transfer of the intervention gains to new settings can be attributed to the introduction of natural maintaining contingencies (Baer & Wolf, 1970; Stokes & Baer, 1977). For Tim and Ben, their new teachers did not need special instruction to provide assistance when these boys said "Help me," nor did Ben's teacher need training to respond with attention when he said

"Am I doing good work?" When his articulation improved, Hal's new teacher responded with assistance when he said "I don't understand." We were successful in choosing behaviors (the communicative responses) that elicited maintaining contingencies. The ability of these responses to transfer to new situations is illustrated in a note sent by Hal's mother to his teacher shortly after the introduction of functional communication training.

When (Hal) came home from school yesterday he asked for a snack. After he finished he asked for more and I told him "No, not now." Instead of getting upset, he looked at me and said, "I don't understand." I immediately remembered that this was all part of the program you were telling me about. Even though I couldn't give him the answer he wanted I could see that he was trying to cope with it in a new way. I was very excited. After a little while I gave him another snack. I can't believe he generalized it to such a different type of situation at home.

The value of functional communication training may lie not only in its ability to reduce challenging behavior initially, but also in its role in facilitating maintenance and application in new settings. This is especially critical when considering the interventions sometimes recommended for severe challenging behavior. Some interventions (e.g., differential reinforcement of other behavior using dense schedules of reinforcement) are not likely to be encountered outside of specially designed environments. A student who hits herself at fast-food restaurants because she has difficulty with purchases will probably not receive reinforcers by the cashier for short periods in which self-injury is absent. However, it is likely that she will receive help if she asks for help in counting the change. This should, in turn, reduce the probability of her slapping her face without special training of the intervention agent.

It should be noted that preintervention data were not collected in the students' new classrooms or with their new teachers. Therefore, statements about generalization and maintenance are descriptive and are not derived from a functional analysis of these

situations. However, the stability of these students' challenging behaviors across previous settings and teachers provides some confidence in the present results. Additionally, the students involved in this study possessed some verbal skills, possibly limiting the generality of the findings. This concern is lessened somewhat by findings from previous research with individuals exhibiting a range of skills and abilities (Bird et al., 1989; Durand & Kishi, 1987; Wacker et al., 1990). Future research should examine collateral effects as well as analyze possible individual differences in reactions to this intervention.

It is significant that the results of our intervention transferred to teachers who were unaware of and untrained in the procedures. Because a major consideration for behavior-change intervention is training personnel, our results suggest that it may not be necessary to train everyone. This may be particularly true if we are successful in teaching students a form of the response that others will respond to in the desired way.

Two different assessment methods were used in this study: the Motivation Assessment Scale and analogue assessments. Because all forms of assessment include sources of error (Nelson & Hayes, 1986), we cannot be completely certain of the variables maintaining these behaviors. Our hypotheses are more reliable, however, if two or more methods agree (Durand, 1990). This is a generally accepted approach in traditional assessment practice (e.g., Anastasi, 1982; Cronbach, Gleser, Nanda, & Rajaratnam, 1972; Haynes & Horn, 1982), yet it is one usually overlooked in the literature on assessment of severe challenging behavior. Future research and practice should employ multiple valid measures for assessing maintaining variables.

The present study and others have demonstrated the success of functional communication training in environments such as schools, residential facilities, group homes, and vocational training placements (Bird et al., 1989; Durand & Kishi, 1987). It is important to determine whether students can be taught to communicate effectively with community members in settings such as movies, buses, and stores, and if this would result in reduced

challenging behavior. We must extend our criteria of what constitutes a successful intervention to include behavior improvements in any setting students may encounter and with any person with whom students may interact (Meyer & Evans, 1989). Only then will we be able to say that we have initiated meaningful change in the behavior of our students.

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